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(54) INK JET RECORDING PAPER AND INK JET IMAGE FORMING METHOD EMPLOYING THIS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an ink jet recording sheet having superior printing characteristics, glossiness, water resistance, and an antiabrasion property.

SOLUTION: The ink jet recording sheet is provided in turn with an ink receptor layer consisting of water soluble polymer and a layer consisting of thermoplastic organic resin particles on at least one surface of a water resistance carrier from the direction near the carrier. Also, this recording sheet can be provided by turns with an ink receptor layer and a layer containing thermoplastic organic resin particle containing thermoplastic organic resin particles of a maximum film making temperature(MFT) being lower than 100°C on at least one surface of the water resistance carrier from the direction near the carrier, and also can be provided successively with an ink receptor layer and a layer consisting of ionomer resin on at least the water resistance carrier from the direction near the carrier.

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## CLAIMS

## [Claim(s)]

[Claim 1] The sheet for ink jet record characterized by preparing the ink absorbing layer which consists of a water-soluble polymer, and the layer which consists of a thermoplastic organic resin particle one by one from the direction near this base material at least at one side of a waterproof base material.

[Claim 2] The sheet for ink jet record according to claim 1 characterized by choosing said water-soluble polymer from gelatin, a polyvinyl pyrrolidone, a water-soluble cellulosic, polyvinyl alcohol, polyacrylamide, and polyacrylic acid.

[Claim 3] The sheet for ink jet record with which it is the sheet for ink jet record which prepared the ink absorbing layer and the layer which consists of a thermoplastic organic resin particle one by one from the direction near this base material at least in one side of a waterproof base material, and the layer which consists of this thermoplastic organic resin particle is characterized by the thermoplastic organic resin particle and the minimum membrane formation temperature of less than 100 degrees C containing [ the minimum membrane formation temperature ] a thermoplastic organic resin particle 100 degrees C or more.

[Claim 4] The sheet for ink jet record characterized by being the sheet for ink jet record which prepared the ink absorbing layer and the layer which consists of a thermoplastic organic resin particle one by one from the direction near this base material at least in one side of a waterproof base material, and this thermoplastic organic resin particle being ionomer resin.

[Claim 5] The sheet for ink jet record according to claim 3 or 4 characterized by for an ink absorbing layer mainly consisting of a water-soluble polymer, and choosing this water-soluble polymer from gelatin, a polyvinyl pyrrolidone, a water-soluble cellulosic, polyvinyl alcohol, polyacrylamide, and polyacrylic acid.

[Claim 6] The sheet for ink jet record according to claim 3 or 4 characterized by for an ink absorbing layer mainly consisting of non-subtlety grains, and these non-subtlety grains consisting of at least one sort of a porosity silica, a gaseous-phase method silica, hydrated alumina, and a gaseous-phase method alumina.

[Claim 7] The sheet for ink jet record according to claim 1, 3, or 4 characterized by the particle size of a thermoplastic organic resin particle being 0.1 micrometers to 10 micrometers.

[Claim 8] The sheet for ink jet record according to claim 1, 3, or 4 characterized by the weight ratio of the layer which consists of an ink absorbing layer and a thermoplastic organic resin particle being 10/2 to 1/1.

[Claim 9] The ink jet image formation approach which is the image formation approach using the sheet for ink jet record given in either of the 8 publications from claim 1, and is characterized by carrying out heating eburnation of the thermoplastics particle by heating this sheet for ink jet record after printing on this sheet for ink jet record.

[Claim 10] The ink jet image formation approach that it is the approach of carrying out heating eburnation when this approach of carrying out heating eburnation lets between heating of two, and the pressurized rolls pass in the ink jet image formation approach according to claim 9, and the pressure concerning the ink jet record form side by this pressure roll is characterized by one to 20 Kgf/square planar pressure cm being.

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] About the ink jet image formation approach using the sheet for ink jet record and this which mainly use water color ink, the gloss of this invention of an ink jet record sheet is also high, and it not only excels in the clear nature of an image, definition, and homogeneity especially, but it relates to the ink jet image formation approach using the sheet for ink jet record and this which were further excellent also in the water resisting property after printing.

[0002]

[Description of the Prior Art] Ink jet record does not have the noise, high-speed printing is possible for it, it is adopted as a terminal printer etc., and has spread quickly in recent years. Moreover, by using two or more ink nozzles, it is also easy to perform multicolor record and multicolor ink jet record by various kinds of ink jet recording methods is performed. Use of the ink jet printer which can form a complicated image quickly and correctly as a hard copy listing device of image information, such as an alphabetic character created especially by computer, and various graphic forms, a photograph, attracts attention. Furthermore, the image information created by these computers is recorded on the transparent sheet for record with an ink jet printer, and this is used also as manuscripts, such as OHP (over head projector). Moreover, they are the output of the design image in the application and design section of the color block copy in the printing field as which the image quality near a photograph is required as a field of the invention of the ink jet printer which attracts attention especially in recent years, the large-sized poster which can be created simple using a large-sized ink jet plotter, a display, a flag, etc. Furthermore, a digital photograph becomes familiar like, the attempt which is represented by the digital camera in recent years and which outputs these images with a cheap ink jet printer is made, and the ink jet printer possessing the mode and ink only for photographs has also been put on the market.

[0003] As ink for ink jet record, from the field of safety and a recording characteristic, the ink which mainly uses water and polyhydric alcohol as a principal component is used, and clogging prevention of ink, improvement in a discharge property, etc. are achieved.

[0004] As a sheet for record used for an ink jet recording method, the sheet for record which comes to prepare the ink absorption layer of the porosity which consists pigments, such as amorphous silica, of water-soluble binders, such as polyvinyl alcohol, on the base material called usual paper and a usual ink jet record form has been used conventionally.

[0005] However, when the sheet for record of these former was used for the oban display poster outside indoor [ where a water resisting property is asked by high definition and the gloss pan ] etc., there were some big troubles. That is, when printed using the record sheet of these former, the blot of ink was large, and especially since the paper itself which gloss is not only low, but is a base material was weak in water, the water resisting property which poses a problem by the outdoor use was low, and it was not what is equal to use.

[0006] Furthermore, although there was a water resisting property of the base material itself when the film which consists a base material of polyethylene terephthalate resin etc. instead of paper was used, there was a fault of being unable to use it, in order that there is no water resisting property in this ink absorption layer, therefore this ink absorption layer may melt into water and may flow and fall to it, since the water soluble polymer is generally used as an ink absorption layer which has gloss. Moreover, although the water resisting property was higher than the layer which consists of a water soluble polymer mentioned above when the ink absorption layer of the porosity which consists of binders, such as pigments, such as amorphous silica, and water-soluble binders, such as polyvinyl alcohol, which have been used from the former on the film base, and RATTEKUSU, was prepared, a coated layer not only separates also with few impacts, but the reinforcement on the front face of a coated layer was weak, and gloss was a

thing remarkably low. Furthermore, the present condition is that ink permeates an opaque ink absorption layer deeply, and the definition of printing falls remarkably and cannot use it.

[0007] In order to solve such a trouble, many sheets for record which prepared the ink absorption layer with the definition of high printing and glossiness are proposed. For example, at JP,60-168651,A, use of polyvinyl alcohol and a polyacrylic acid system water soluble polymer is Provisional Publication No. 60. - No. 262685 -- use of hydroxyethyl cellulose -- the acceptance layer in which use of the mixture of a water-soluble cellulose and a polyvinyl pyrrolidone was formed for use of the mixture of a carboxymethyl cellulose and polyethylene oxide from the gelatin water solution Of Specification pH by JP,62-263084,A by JP,61-193879,A at JP,61-181679,A -- moreover, in JP,1-146784,A, use of the mixture of gelatin and a surfactant is proposed, respectively. However, although printing definition and the gloss of the sheet for record which consists of these water-soluble polymers were high, there was no water resisting property.

[0008] Moreover, many record sheets which improved a water resisting property and printing nature with pigments, such as amorphous silica, and a specific binder are also proposed. For example, as for each of JP,6-32046,A, JP,6-143800,A, JP,7-32725,A, JP,7-149037,A, and JP,8-34160,A, the combination of a pigment, a specific binder, and a specific compound is proposed. It was not the object with which gloss does not have any combination although \*\* and these have attained the high water resisting property, and it can be satisfied of surface reinforcement and printing nature.

[0009] Many record sheets which improved a water resisting property and glossiness are also proposed by combining the second third component if needed [ a specific polymer and if needed / specific ]. For example, for use of a water-soluble polyamide, at JP,7-242053,A, use of denaturation polyester and denaturation polyurethane is JP,8-10,A in JP,7-314884,A. In No. 4055, JP,8-156397,A, and JP,9-175008,A, use of the polymer as which use of specific polyester resin was specified in JP,8-197835,A and JP,9-175003,A, and the presentation was further specified for use of a polyvinyl acetal by JP,8-207428,A, JP,8-337046,A, JP,9-110939,A, JP,9-175001,A, and JP,9-193532,A is proposed. \*\* and these were not what printing nature will get worse if a water resisting property is satisfied, a water resisting property will get worse if printing nature is satisfied, and can be satisfied as real use, although gloss has improved to be sure.

[0010] Furthermore, many record sheets which improved deck-watertight-luminaire-ization are proposed by irradiating the light or the high energy line which an ink absorption layer is made to construct a bridge by the cross linking agent, and deck-watertight-luminaire-izes it, and constructing a bridge. For example, by JP,7-237347,A and JP,8-58226,A, use of electron ray hardenability resin is proposed for use of the resin with which optical bridge formation of the record sheet which contains a cross linking agent in an ink absorption layer in JP,8-67064,A, JP,8-67065,A, JP,9-11605,A, and JP,9-156203,A was carried out in JP,7-309063,A and JP,9-71040,A. \*\* and these were not the objects which the absorptivity of ink is bad, and printing nature falls and can be used, although the water resisting property has improved to be sure.

[0011] Many record forms which arrange a resin layer the ink absorption layer which consists of a porous pigment, and on it, and carry out eburnation of the resin layer after printing, and record approaches are also proposed. In JP,2-31673,B, the combination of a pigment layer and a thermofusion layer uses hydrated alumina for a pigment layer in JP,8-2090,A, JP,9-104163,A, and JP,9-104164,A, and combination of combination with a thermofusion layer is proposed. To be sure, although a water resisting property and glossiness were improving with such combination, it could not say that it was still enough, and the fault in which printing is further somber about printing nature, like that ink overflows and ink bleeds is not improved completely. When it was going to obtain the water resisting property which becomes enough especially, there was a problem that \*\*\*\*-proof on the front face of a record sheet fell.

[0012]

[Problem(s) to be Solved by the Invention] Therefore, the 1st purpose of this invention is offering the ink jet image formation approach using the ink jet record sheet and this which are fully satisfied with coincidence of resolution, gloss, and a water resisting property. The 2nd purpose of this invention is improving a water resisting property and \*\*\*\*-proof, maintaining high gloss.

[0013]

→ [Means for Solving the Problem] The 1st purpose of the above of this invention was attained by at least one side of a waterproof base material from the direction near this base material with the sheet for ink jet record characterized by preparing the ink absorbing layer which consists of a water-soluble polymer, and the layer which consists of a thermoplastic organic resin particle one by one.

[0014] From the direction with the 2nd purpose of the above of this invention near [ at least one side of (1) waterproofness base material ] this base material to an ink absorbing layer It is the sheet for ink jet record which prepared the layer which consists of a thermoplastic organic resin particle one by one. The sheet for ink jet record with which the layer which consists of this thermoplastic organic resin particle is characterized by the thermoplastic organic

resin particle and the minimum membrane formation temperature of less than 100 degrees C containing [ the minimum membrane formation temperature ] a thermoplastic organic resin particle 100 degrees C or more, (2) From the direction near [ at least one side of a waterproof base material ] this base material to an ink absorbing layer It is the sheet for ink jet record which prepared the layer which consists of a thermoplastic organic resin particle one by one, and, therefore, was attained by the sheet for ink jet record characterized by this thermoplastic organic resin particle being an ionomer. [0015]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail. Arranging a resin layer on the ink absorption layer which consists of a porous pigment, carrying out heating eburation of the resin layer after printing, and giving a water resisting property is known. However, the record sheet which combined the pigment layer and thermoplastics layer of such porosity was not what is fully satisfied with coincidence of resolution, glossiness, and a water resisting property. As a result of inquiring wholeheartedly, in order for this invention person to fully have been satisfied with coincidence of the resolution, glossiness, and water resisting property which are the 1st purpose of this invention, it found out accomplishing with the ink jet record sheet which prepared the layer which consists of a thermoplastic organic resin particle on the ink absorbing layer which consists of a water-soluble polymer.

[0016] In this invention, as for the layer which consists of a thermoplastics particle, being shown in the maximum front face is desirable, and a water resisting property is obtained by dissolving or dissolving and making this thermoplastics particle content layer coat-ize with a solvent or heating after printing. In this case, high resolution, glossiness, and a water resisting property are obtained by using a water-soluble polymer for a lower layer ink absorbing layer as a principal component.

[0017] In the record sheet of this invention, as a water-soluble polymer used for an ink absorbing layer, although all the polymers that dissolve in water in ordinary temperature ordinary pressure can be used, when the engine performance for which ink jet record of ink absorptivity, ink coloring nature, gloss, etc. is asked is taken into consideration, it is desirable to use combining one sort or two sorts or more of water-soluble polymers out of gelatin, a polyvinyl pyrrolidone, a water-soluble cellulosic, polyvinyl alcohol, polyacrylamide, and polyacrylic acid.

[0018] Gelatin is preferably used especially in the water-soluble polymer used for this invention. Although either can be used if it is gelatin which used the collagen of an animal as the raw material as gelatin used, the gelatin which used as the raw material a pig skin, oxbide, and the collagen that used the cow bone as the raw material is desirable.

Although there is furthermore especially no limit as a class of gelatin, liming gelatin, acid-treatment gelatin and a gelatin derivative (for example, JP,38-4854,B --) said -- No. 5514 [ Showa 39 to ] -- said -- No. 12237 [ Showa 40 to ] - - said -- No. 26345 [ Showa 42 to ] U.S. Pat. No. 2525753, 2594293, 2614928, The gelatin derivative of a publication can be used for 2763639, 3118766, 3132945, 3186846, 3312553, the British patent No. 861414, 1033189, etc. combining independent or them. Moreover, especially as jelly strength (based on the PAGI method and a bloom type jelly strength meter) of gelatin, it is desirable that it is 200g or more 150g or more.

[0019] Although a polyvinyl pyrrolidone, polyvinyl alcohol, polyvinyl alcohol, polyacrylamide, and polyacrylic acid are most preferably used as water-soluble vinyl polymer in water-soluble polymers other than the gelatin preferably used in this invention vinyl formals, such as polyvinyl pyridinium halide and various denaturation polyvinyl alcohol, and the derivative (JP,60-145879,A --) of those said -- No. 220750 [ Showa 60 to ] -- said -- No. 143177 [ Showa 61 to ] -- said -- No. 235182 [ Showa 61 to ] Reference of No. 261089 [ Showa 61 to ] said -- No. 235183 [ Showa 61 to ] - - said -- No. 237681 [ Showa 61 to ] -- said -- The poly dimethyl acrylamide, poly dimethylamino acrylate, an acrylic-acid methacrylic-acid copolymer salt, the polymer (JP,60-168651,A --) containing acrylic radicals, such as polymethacrylic acid soda and an acrylic-acid vinyl alcohol copolymer salt Referring to the said No. 9988 [ Showa 62 to ], a polyethylene glycol, a polypropylene glycol, polyvinyl ether (JP,61-32787,A, this Showa 61 - No. 237680, this Showa refer to 61 No. -277483), etc. are used preferably.

[0020] As a water-soluble cellulosic preferably used in this invention, water-soluble cellulose, such as methyl cellulose, a carboxymethyl cellulose, a hydroxymethyl cellulose, hydroxyethyl cellulose, and hydroxypropylcellulose, can be mentioned. To ink receptiveness or a dot repeatability pan, a carboxymethyl cellulose, hydroxyethyl cellulose, and methyl cellulose are still more desirable from the point of the tightness with solid one of the printing section also in these water solubility cellulosic.

[0021] Although there will be especially no limit if the thermoplastic organic resin-particle in this invention is the organic substance which has thermoplasticity From points, such as coat nature, a film strength, coat gloss, and film-forming, to polyethylene Polypropylene, a polyisobutylene, polyethylene wax, oxidization polyethylene, A polytetrafluoroethylene and ethylene-acrylic-acid copolymer, an ethylene-ethyl-acrylate copolymer, An olefin independent, copolymers, or these derivatives, such as an ethylene-vinylacetate copolymer, It is independent, or a polyvinyl chloride, a vinyl chloride vinyl acetate copolymer, a vinyl chloride-acrylic ester copolymer, a polyvinylidene

chloride, styrene butadiene rubber, NBR rubber, etc. are mixed, and it is used.

[0022] As for the minimum membrane formation temperature (MFT) of the thermoplastic organic resin particle in this invention, it is desirable that it is in the range of 40 to 150 degrees C. a thermoplastic organic resin particle combining with the minimum membrane formation temperature, and forming membranes -- the minimum -- required temperature is meant. This minimum membrane formation temperature can be measured by the temperature gradient plate method as indicated by Soichi Muroi work "chemistry of a macromolecule latex" (1997) etc. When the minimum membrane formation temperature of a thermoplastic organic resin particle is lower than 40 degrees, in the usual ink jet record sheet production process, a thermoplastic organic resin particle forms membranes, and the absorptivity of ink gets worse. Difficulty follows on manufacturing an ink jet record sheet at the temperature which a thermoplastic organic resin particle furthermore does not form from the point of drying efficiency. Moreover, since sufficient heating value is not obtained by the usual heat-treatment but a uniform coat is hard to be formed when the minimum membrane formation temperature of a thermoplastic organic resin particle exceeds 150 degrees, gloss falls, or a water resisting property falls. Furthermore, if temperature is raised beyond the minimum membrane formation temperature in order to obtain a uniform coat, it is not desirable from a waterproof base material falling with heat, and gloss falling deformation and by deteriorating, or smooth nature falling. Furthermore, in order to make the optimal the ease of coat formation, the homogeneity of a coat, and reinforcement of a coat, as for the minimum membrane formation temperature (MFT) of the thermoplastic organic resin particle in this invention, it is more desirable that it is in the range of 60 to 130 degrees C.

→ [0023] Although especially a limit does not have the particle size of the thermoplastic organic resin particle in this invention, the object which is usually in the range of 0.01 to 20 micrometers is used. When the particle size of a thermoplastic organic resin particle is smaller than 0.01 micrometers, a dense layer is formed in the ink upper layer, and the absorptivity of ink gets worse or crocodiles. When the particle size of a thermoplastic organic resin particle exceeds 20 micrometers, it is not desirable from compactness sufficient in case heating eburnation of the thermoplastic organic resin particle is carried out not being obtained, but gloss falling or a water resisting property falling, although the absorptivity of ink is good. In order to obtain a still more uniform coat, particle size is more desirable and a 0.1 to 10 micrometers thermoplastic organic resin particle is used.

[0024] In order to satisfy a water resisting property and \*\*\*\*-proof to coincidence, maintaining the high gloss which is the 2nd purpose of this invention, the minimum membrane formation temperature (MFT) prepares a less than 100-degree C thermoplastics particle and the layer in which MFT contains a thermoplastics particle 100 degrees C or more on (1) ink absorbing layer. Or the layer containing ionomer resin is prepared on (2) ink absorbing layers.

[0025] In the above (1) and (2), as for a resin layer, preparing in the maximum surface is desirable, and it can form the image which was excellent in high gloss at a water resisting property and \*\*\*\*-proof by heating these resin layers at about 100-140 degrees C after printing. In this case, especially the presentation of an ink absorbing layer may be the ink absorbing layer which is not limited but uses a water-soluble polymer as a principal component, or an ink absorbing layer which uses a porous pigment as a principal component.

[0026] What mentioned above the water-soluble polymer used for an ink absorbing layer is mentioned. Moreover, organic [ well-known ] and an inorganic pigment are used as a porous pigment. Generally, the non-subtlety particle is used. For example, a detailed alumina, colloidal silica, etc. which are manufactured by the porosity silica [ which is manufactured by the wet method ], detailed silica [ which is manufactured by the gaseous-phase method ], detailed hydrated alumina, and gaseous-phase method are used preferably. The detailed silica whose mean particle diameter of the primary particle manufactured also in this by gaseous-phase method which is indicated by JP,60-204390,A is 5-50nm is used preferably. When an ink absorbing layer is mainly formed of non-subtlety grains, a binder is added in order to raise paint reinforcement. As a binder, macromolecule latexes, such as SBR, an ethylene-vinyl acetate copolymer, an ethylene acrylic-acid copolymer, an ethylene acrylic ester copolymer, a styrene acrylic-acid copolymer, acrylic ester, a vinyl chloride, and styrene, etc. are used other than various, water-soluble polymers, such as gelatin, a polyvinyl pyrrolidone, a water-soluble cellulosic, polyvinyl alcohol, a polyvinyl alcohol derivative, polyacrylamide, and polyacrylic acid. Polyvinyl alcohol or a polyvinyl alcohol derivative is the most desirable also in these binders, and it is used.

[0027] The mode of the above (1) is explained to a detail. On an ink absorbing layer, the layer containing two kinds of thermoplastic organic resin particles from which MFT differs is prepared. MFT uses [ MFT ] a thing 100 degrees C or more with a less than 100-degree C thing out of thermoplastics which was mentioned above.

[0028] Preferably, MFT mixes and uses the thermoplastic organic resin particle in the 60-degree-C or more range of less than 100 degrees C, and the thermoplastic organic resin particle in the 100-degree-C or more range of less than 150 degrees C. When MFT uses only the thermoplastic organic resin particle in the 60-degree-C or more range of less than



100 degrees C, although the homogeneity of gloss and a coat is high, water advances from the blemish which the front face got damaged easily low, and the value as goods not only falls, but was generated in the coat when remarkable, and the reinforcement of a coat may reduce it to a water resisting property. Moreover, although the reinforcement of a coat is high when MFT uses only the thermoplastic organic resin particle in the 100-degree-C or more range of less than 150 degrees C, the homogeneity of gloss and a coat is inferior. Therefore, in order to satisfy gloss, water resisting properties, the homogeneity of a coat, and all the surface reinforcement, it is important that MFT mixes and uses the thermoplastic organic resin particle in the 60-degree-C or more range of less than 100 degrees C and thermoplastic 100-degree-C or more organic resin particle which has less than 150 degrees C in the 110-degree-C or more range of less than 150 degrees C preferably. The ionomer resin mentioned later may be used as one of the thermoplastic organic resin particles, and effectiveness more desirable than that case is acquired.

[0029] As for the particle size of a thermoplastic organic resin particle, it is desirable to use the thing of the range mentioned above.

[0030] The range of the latters 0.1-1.5 is suitable for the weight ratio of the addition of two kinds of resin with which MFT differs to the former 1, and it is the range of the latters 0.3-1.2 to the former 1 preferably.

[0031] Next, the mode of (2) is explained in detail. (2) prepares the layer which uses ionomer resin as a principal component on an ink absorbing layer. the resin which ionomer resin introduces ionic bond (bridge formation) between long-chain [ of the olefin (covalent bond) which makes a principal component ], and is obtained -- it is -- as the anion section of ion bridge formation -- a carboxyl group -- moreover, they are alkali metal, alkaline earth metal, and thermoplastics with which metals, such as Zn, are used further as the cation section. the concrete thing of this ionomer resin all has the hydrogen of the carboxyl group of the obtained copolymer, or ester, after carrying out copolymerization of alpha, beta and unsaturated carboxylic acid, or its ester to olefins, such as ethylene and a propylene, -- it is -- a part -- Na, K, Mg, and Zn etc. -- it is obtained by making it permute with a metal ion.

[0032] as ethylene system ionomer resin, ethylene / methacrylic-acid copolymer, ethylene / acrylic-acid copolymer, an ethylene acrylic-acid copolymer / styrene graft copolymer, etc. mention -- having -- as a metal ion -- Na, K, Mg, and Zn etc. -- it is mentioned. Ethylene system ionomer resin is obtained by the well-known process indicated by JP,46-25624,B, JP,61-9403,A, etc., with a well-known technique, is formed into moisture powder and serves as forms, such as aqueous dispersion.

[0033] as the example of such ionomer resin -- the Mitsui DEYUPON poly chemical company make and yes -- milan H-1652 (trademark) -- said -- AM-6004 (trademark) -- said -- AM-7902-1 (trademark) -- said -- there are H-1601 (trademark), CHEMIPEARL [ by Mitsui Chemicals, Inc. ] S (trademark) series, etc.

[0034] The ionomer resin used for this invention has the desirable thing of the range whose MFT is 60-130 degrees C. The range of 0.01-20 micrometers of particle diameter is 0.1-10 micrometers preferably.

[0035] In this invention, ionomer resin may be used combining the above-mentioned thermoplastics.

[0036] The structure of cross linkage disappears at the time of hot forming, and ionomer resin produces a fluidity, and has the structure of cross linkage by the metal ion in ordinary temperature. It found out that a water resisting property and \*\*\*\*-proof were satisfied with coincidence of this invention by using this property. That is, a tough coat is formed by using ionomer resin for a surface layer that it is easy to carry out coat formation by heating melting.

[0037] It is indicated by JP,8-290655,A and this Taira No. 6640 [ ten to ] official report as an example which uses ionomer resin for the ink absorbing layer of the sheet for ink jet record. These improve neither antistatic nature nor printing nature, and do not raise the water resisting property of this invention, and \*\*\*\*-proof.

[0038] The carnauba wax which is the thermofusion matter besides a thermoplastic organic resin particle in the layer which consists of a thermoplastic organic resin particle in this invention, An OKYURI wax, a candelilla wax, a rice wax, haze wax, Beeswax, lanolin, a spermaceti, a montan wax, an ozokerite, a ceresin, A natural wax and its derivatives, such as paraffin wax, a micro crystallin wax, and petrolatum, Sorbitan stearate, propylene glycol monostearate, Surfactants, such as glycerol stearate and polyoxyethylene stearate, A lauric acid, a palmitic acid, a myristic acid, stearin acid, behenic acid, Aluminum stearate, lead stearate, barium stearate, Zinc stearate, palmitic-acid zinc, methyl hydroxystearate, It is a thermoplastic organic resin particle about derivatives, such as higher fatty acids, such as glycerol mono-hydroxystearate, or a metal salt of those, and amide ester. You may add suitably for the purpose of the apparent minimum membrane formation temperature fall on the coat disposition at the time of carrying out heating eburnation.

[0039] The layer which consists of a thermoplastic organic resin particle may be made to contain the water-soluble binder of a minute amount, or the low (for example, 30 degrees C or less) polymeric latex of MFT in this invention in order to obtain the coat nature after spreading. The content is 1 - 10 % of the weight preferably at about 1 - 20 % of the weight to a thermoplastics particle. If the content of a binder increases, since a water resisting property will fall



remarkably, it is not desirable. PORIBINI alcohol is mentioned as a water-soluble desirable binder.

[0040] In this invention, colloid inorganic particles, such as inorganic pigments, such as an indeterminate form porosity silica, a calcium carbonate, talc, clay, a kaolin, a calcium sulfate, a barium sulfate, titanium oxide, a zinc oxide, aluminum silicate, a magnesium silicate, and a calcium silicate, colloidal silica, and a colloidal alumina, a thermosetting organic resin particle, etc. may be suitably added to the layer which consists of a thermoplastic organic resin particle.

[0041] In this invention, in an ink absorbing layer, a surfactant can be added in order to raise dot repeatability in addition to a binder. Which type of an anion system, a cation system, the Nonion system, and a betaine system is sufficient as the surface active agent used, and a low-molecular thing or the low-molecular thing of a macromolecule is sufficient as it. Although one sort or a two or more sort surfactant is added in ink absorbing layer coating liquid, when using it combining two or more sorts of surfactants, it is not desirable to use combining the thing of an anion system and the thing of a cation system. The addition of a surface active agent has 0.001g-desirable 5g to binder 100g which constitutes an ink absorbing layer, and are 0.01-3g more preferably.

[0042] In this invention, the dura mater of the ink absorbing layer can be carried out by the suitable hardening agent in order to raise a water resisting property and dot repeatability. As a concrete example of a hardening agent, the aldehyde system compound like formaldehyde and glutaraldehyde, Diacetyl, the ketone compound like a KURORU 2,4-pentanedione, screw (2-chloro ethylurea)-2-hydroxy - 4, 6-dichloro-1,3,5-triazine, The compound which has a reactant halogen like a U.S. Pat. No. 3288775 publication, A divinyl sulfone, a compound with the reactant olefin like a U.S. Pat. No. 3635718 publication, N-methylol compound like a U.S. Pat. No. 2732316 publication, and the isocyanate like a U.S. Pat. No. 3103437 publication U.S. Pat. No. 3017280 and the aziridine compounds like a 2983611 publication The carbodiimide system compounds like a U.S. Pat. No. 3100704 publication The epoxy compound like a U.S. Pat. No. 3091537 publication, and the halogen carboxy aldehydes like mucochloric acid the inorganic hardening agent like the dioxane derivative like dihydroxy dioxane, chromium alum, potash alum, and a sulfuric-acid zirconium etc. -- it is - these -- one sort -- or two or more sorts can be combined and it can use. The addition of a hardening agent has 0.01g-desirable 10g to water-soluble polymer 100g which constitutes an ink absorbing layer, and are 0.1-5g more preferably.

[0043] In this invention, the above-mentioned inorganic pigment, a surfactant, and various well-known additives other than a hardening agent, such as the fixing agent of a coloring color, a color pigment, and an ink color, an ultraviolet ray absorbent, an anti-oxidant, the dispersant of a pigment, a defoaming agent, a leveling agent, antiseptics, a fluorescent brightener, a viscosity stabilizer, and a pH regulator, can also be further added in the layer which consists of an ink absorbing layer and a thermoplastic organic resin particle.

[0044] In this invention, it is desirable to set to 10 / 2 - 1/1 the layer (weight ratio) of the layer which consists of an ink absorbing layer and a thermoplastic organic resin particle which consists of an ink absorbing layer / a thermoplastic organic resin particle comparatively (weight ratio).

[0045] In this invention, as coverage of an ink absorbing layer, 3 - 40 g/m<sup>2</sup> is desirable, and 5 - 30 g/m<sup>2</sup> is still more desirable. If there is less coverage of an ink absorbing layer than 3 g/m<sup>2</sup>, ink will overflow and it will become an unsightly image. Although the absorptivity of ink does not have a problem when the coverage of an ink absorbing layer exceeds 30 g/m<sup>2</sup>, in low humidity or high humidity, as for the case of the ink absorbing layer using a water-soluble polymer, the curl property of a sheet gets worse remarkably. Moreover, in the case of the ink absorbing layer using non-subtlety grains, ink sinks, about [ that only an indistinct image is obtained ] and crease crack nature gets worse, and a generating case is [ a check ] during conveyance by the printer. Also after carrying out heating eburnation of the thermoplastics particle, a water resisting property becomes furthermore, less enough [ that penetration of the water from an intercept tends to take place ].

[0046] In this invention, 1 - 15 g/m<sup>2</sup> is desirable as coverage of the layer which consists of a thermoplastic organic resin particle. The coat at the time of the coverage of the layer which consists of a thermoplastic organic resin particle carrying out heating eburnation in less than two 1 g/m is not enough, and gloss and a water resisting property get worse. Moreover, exceeding 15 g/m<sup>2</sup>, in many, printing nature not only gets worse, but it becomes easy to be cracked to a coat and a water resisting property and gloss get worse as a result.

[0047] Once cheating out of the ink absorbing layer in this invention to the gel state, it is desirable to dry by the so-called cold dry cleaning method dried at low temperature. This is the approach of drying at low temperature that the sol of a binder and a gelation phenomenon should be used and a regular film surface should be formed. The process of desiccation Yuji Harasaki work "coating engineering" (Asakura Publishing in the Showa 46 fiscal year), The vapor rate of a solvent falls to the constant drying rate period of a fixed, the evaporation of the solvent per an ingredient pre-heating period and unit time amount, i.e., the vapor rate of a solvent, desiccation process, and after that gradually as indicated by 278-281 pages. A steam is almost lost (that is, a paint film serves as equilibrium moisture content under

the temperature-and-humidity conditions of the open air mostly.). It is divided into three processes of the falling-drying-rate period of the desiccation process of until, and a gas conditioning period may be established further as occasion demands. Usually, when about about 5 - 8% of equilibrium moisture content is reached, it becomes the completion of desiccation, but if temperature (this temperature is called surface wet-bulb temperature) of the film surface in a desiccation stroke is made low, it will become a regular paint film and will become a good ink absorbing layer. After applying ink absorbing layer coating liquid, surface wet-bulb temperature carries out the cooling set (gelation) of the spreading layer below with the setting temperature of coating liquid, and, also after that, an acceptance layer is gradually dried at the temperature below the setting temperature of coating liquid. After a solvent evaporates and solid content concentration rises, temperature may be raised and extent which does not start set return may be made to dry it.

[0048] Although the methods of application (for example, a slide lip method, a curtain method, an extrusion method, an air knife method, a roll coating method, a rod bar coating method, etc.) usually used are used as the method of application of the ink absorbing layer coating liquid in this invention, a slide lip method and a curtain method are used still more preferably in that the layer which consists of an ink absorbing layer and a thermoplastic organic resin particle can be prepared at once.

[0049] In this invention, although an ink record sheet is the two-layer configuration of the layer which consists of an ink absorbing layer and a thermoplastic organic resin particle, the ink absorbing layer in this invention may be further made a multilayer configuration. It is made the lamination multilayered by arranging the layer which generally gave functions, such as an ink absorption layer, an ink fixing layer, a waterproof layer, and an ink transparency layer, for the ink absorbing layer if needed. As an example of the multilayer configuration of an ink absorption layer, what was indicated by JP,57-89954,A, 60-224578, and 61-12388 is mentioned.

→ [0050] As a waterproof base material used in this invention, a transparent base material and an opaque base material can be used. As a transparent base material, each well-known thing can use it conventionally, for example, a film or a plate, glass plates, etc., such as polyester resin, diacetate resin, triacetate resin, acrylic resin, polycarbonate resin, a polyvinyl chloride, polyimide resin, cellophane, and celluloid, are mentioned, and the film which consists of polyethylene terephthalate also in these is used most preferably.

[0051] As for such a transparent waterproof base material, it is desirable that it is that the thickness of whose is about about 10-200 micrometers.

[0052] As an opaque waterproof base material, each thing which have a synthetic paper, resin covering paper, the conventionally well-known opaque film containing a pigment, a conventionally well-known firing film, etc. can use it. Although gloss, the resin covering paper from the point of smooth nature, and various films are more desirable, the film with which resin covering paper and a whiteness degree similar to the base material for photographs, and reinforcement consist of polyethylene terephthalate of high entering a pigment is used still more preferably from a feeling of a feel, and a high-class feeling.

[0053] Although the paper which especially a limit does not have the stencil paper which constitutes the resin covering paper as a waterproof base material preferably used in this invention, and is generally used can be used, smooth stencil paper which is used for the base material for photographs more preferably is desirable. as the pulp which constitutes stencil paper -- natural pulp, playback pulp, a synthetic pulp, etc. -- one sort -- or two or more sorts are mixed and it is used. Additives, such as the sizing compound generally used of paper manufacture, a paper reinforcing agent, a loading material, an antistatic agent, a fluorescent brightener, and a color, are blended with this stencil paper.

[0054] Furthermore, surface spreading of a surface sizing compound, a surface paper durability agent, a fluorescent brightener, an antistatic agent, a color, the anchoring agent, etc. may be carried out.

[0055] Moreover, although there is especially no limit about the thick taste of stencil paper, the good thing of the surface smooth nature which impressed paper under paper milling or in the calender after paper milling, and compressed the pressure is desirable, and the basis weight has desirable 30 - 250 g/m<sup>2</sup>.

[0056] As resin of resin covering paper, the resin hardened with polyolefin resin or an electron ray can be used. As polyolefin resin, it is the copolymers which consist or more of two of olefins, such as a homopolymer of olefins, such as low density polyethylene, high density polyethylene, polypropylene, polybutene, and the poly pentene, or ethylene propylene rubber, and such mixture, and the thing of various kinds of consistencies and a melt viscosity characteristic (melt index) can be independently used for them, mixing.

[0057] In the resin of resin covering paper, moreover, white pigments, such as titanium oxide, a zinc oxide, talc, and a calcium carbonate, Fatty-acid amides, such as octadecanamide and an arachidic acid amide, zinc stearate, Fatty-acid metal salts, such as calcium stearate, aluminum stearate, and magnesium stearate, Antioxidants, such as IRUGA NOx 1010 and IRUGA NOx 1076, Blue pigments and colors, such as cobalt blue, ultramarine blue, sicilian blue, and a

copper phthalocyanine blue, It is desirable to add combining suitably various kinds of additives, such as a pigment of Magentas, such as cobalt violet, fast violet, and manganese purple, a color, a fluorescent brightener, and an ultraviolet ray absorbent.

[0058] In the case of polyolefin resin, it is manufactured by the so-called extrusion coating method which casts the resin which carried out heating fusion in in the paper [ Hara ] the resin covering paper which is the base material preferably used in this invention runs, and the both sides are covered with resin. Moreover, after applying resin by coating machines generally used, such as a gravure coating machine and a blade coating machine, in the case of the resin hardened with an electron ray, an electron ray is irradiated, it stiffens resin, and is covered. Moreover, before covering resin in stencil paper, it is desirable to perform activation, such as corona discharge treatment and flame treatment, to stencil paper. According to the application, as for the field (front face) where the ink absorbing layer of a base material is applied, it has a glossy surface, a mat side, etc., and especially a glossy surface is used for dominance. It is more desirable to carry out resin covering from the point of curl prevention, although it is not necessary to cover resin at the rear face. A rear face is usually a mat side and can perform activity processing of corona discharge treatment, flame treatment, etc. also to front flesh-side both sides a front face or if needed. Moreover, as a thick taste of a covering resin layer, although there is especially no limit, generally coating of it is carried out to the 5-50-micrometer thick taste to a front face or front flesh-side both sides.

[0059] Various kinds of back coat layers can be painted on the base material in this invention for antistatic nature, conveyance nature, curl tightness, etc. A back coat layer can be made to contain combining suitably an inorganic antistatic agent, an organic antistatic agent, a hydrophilic binder, a latex, a curing agent, a pigment, a surfactant, etc.

[0060] As the heating means, there is especially no limit that what is necessary is just to carry out at the temperature beyond the minimum membrane formation temperature of a thermoplastic organic particle as the ink jet image formation approach of carrying out heating eburnation processing of the thermoplastic organic particle for the sheet for ink jet record in this invention with heating, and obtaining an ink jet image. Approaches, such as using the ferrotype oven stuck to the heating mirror plane drum which lets between heating rollers, such as a laminator often used for the after treatment of the oban printer output image which specifically applies hot blast directly, and which applies an iron, pass, and which is used for desiccation of a photograph etc., are mentioned. By letting between the rolls pressurized from the ability of an oban to be heat-treated to homogeneity also in these approaches pass, the approach using the laminator which can carry out heating eburnation is more desirable, and it is still more desirable that the pressure applied by this pressure roll is one to 20 Kgf/square cm as planar pressure. Since the lack of gloss of a front face and waterproof lack occur from fault, like how to transmit the heat with which how which \*\* requires becomes an ununiformity becomes an ununiformity when planar pressure is smaller than 1 Kgf/square cm, it is not desirable. Moreover, it is not desirable in order for the sheet for ink jet record itself with which a front face is ruined with itself and gloss falls when \*\* starts too much to deform with heat and pressure, when \*\* which exceeds 20 Kgf/square cm is applied and heating eburnation of the thermoplastic organic particle is carried out.

[0061]

[Example] Hereafter, although an example explains this invention in detail, the contents of this invention are not restricted to an example. In addition, that it is with the section means the weight section.

[0062] It is the multilayer extrusion method about the layer which consists of the ink absorbing layer coating liquid and the thermoplastic organic resin particle which are shown below on the resin covering paper base material shown in the example 1 following. After adjusting each paint volume and carrying out coincidence spreading so that the solid content coverage of the layer which the solid content coverage of an ink absorbing layer becomes from 10g/m<sup>2</sup>, and a thermoplastic organic resin particle may be set to 5g/m<sup>2</sup>, the cooling set was immediately carried out for 10 seconds, and the desiccation zone where temperature is high was passed gradually, the temperature and humidity of a desiccation zone were controlled so that surface wet-bulb temperature became 30 degrees C or less, and the sheet 1 for ink jet record of this invention was produced.

[0063] Resin covering paper; resin covering paper which applies the resin constituent which consists of low density polyethylene (70 sections), high density polyethylene (20 sections), and titanium oxide (ten sections) to the front face of the base paper of 120g which consists of pulp combination of LBKP (50 sections) and LBSP (50 sections)/m<sup>2</sup> two times 25 g/m, and comes to apply the resin constituent which becomes a rear face from high dense polyethylene (50 sections) and low density polyethylene (50 sections) 25 g/m<sup>2</sup>.

[0064]

Liquid presentation of an ink absorbing layer;

Liming gelatin (8% water solution) 49 section carboxymethyl cellulose (8% water solution) The 49 section G 2-ethylhexyl sulfo succinic-acid soda (1% water solution) 2 section [0065]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
 Ethylene-vinylacetate copolymer (10% water dispersion) The 100 section minimum membrane-formation temperature: 90 degrees C, particle-size:5micrometer [0066] The coating liquid presentation of the layer which consists of a <production of record sheet 2 of this invention> ink absorbing layer and a thermoplastic organic resin particle was produced like said record sheet 1 except having made it shown below.

[0067]

Liquid presentation of an ink absorbing layer;  
 Liming gelatin (8% water solution) 49 section polyvinyl pyrrolidone (K-30) (8% water solution) The 49 section G 2-ethylhexyl sulfo succinic-acid soda (1% water solution) 2 section [0068]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
 Ethylene-vinylacetate copolymer (10% water dispersion) The 100 section minimum membrane-formation temperature: 90 degrees C, particle-size:5micrometer [0069] It produced like said record sheet 1 except the liquid presentation of the layer which consists of a <production of record sheet 3 of this invention> thermoplasticity organic resin particle having been shown below.

[0070]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
 Ethylene-vinylacetate copolymer (10% water dispersion) The 100 section minimum membrane-formation temperature: 50 degrees C, particle-size:5micrometer [0071] It produced like said record sheet 1 except the liquid presentation of the layer which consists of a <production of record sheet 4 of this invention> thermoplasticity organic resin particle having been shown below.

[0072]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
 Ethylene-acrylic ester copolymer (10% water dispersion) The 100 section minimum membrane-formation temperature: 135 degrees C, particle-size:1micrometer [0073] It produced like said record sheet 1 except the liquid presentation of the layer which consists of a <production of record sheet 5 of this invention> thermoplasticity organic resin particle having been shown below.

[0074]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
 Ethylene-vinylacetate copolymer (10% water dispersion) The 100 section minimum membrane-formation temperature: 90 degrees C, particle-size:0.01micrometer [0075] It produced like said record sheet 1 except the liquid presentation of the layer which consists of a <production of record sheet 6 of this invention> thermoplasticity organic resin particle having been shown below.

[0076]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
 Ethylene-vinylacetate copolymer (10% water dispersion) The 100 section minimum membrane-formation temperature: 90 degrees C, particle-size:20micrometer [0077] The solid content coverage of the layer which consists of a <production of record sheet 7 of this invention> ink absorbing layer and a thermoplastic organic resin particle was produced like said record sheet 1, except that it was made for the solid content coverage of the layer which the solid content coverage of an ink absorbing layer becomes from 10 g/m<sup>2</sup> and a thermoplastic organic resin particle respectively to be set to 1g/m<sup>2</sup>.

[0078] The solid content coverage of the layer which consists of a <production of record sheet 8 of this invention> ink absorbing layer and a thermoplastic organic resin particle was produced like said record sheet 1, except that it was made for the solid content coverage of the layer which the solid content coverage of an ink absorbing layer becomes from 8 g/m<sup>2</sup> and a thermoplastic organic resin particle respectively to be set to 8g/m<sup>2</sup>.

[0079] It produced like said record sheet 1 except having used the white polyethylene terephthalate film (the product made from ICI MERINEKKUSU 97 micrometers) as a <production of record sheet 9 of this invention> waterproofness base material.

[0080] <Example 1 of a comparison> The layer which consists of a thermoplastic organic resin particle used in in the paper [ resin covering ] it used with said record sheet 1 with said record sheet 1 was applied, and the ink absorbing layer used with said record sheet 1 still the more nearly same on it was respectively applied by the extrusion method. All solid content coverage was made the same as that of said record sheet 1.

[0081] The ink jet record sheet as well as said record sheet 1 was produced except having used the paper of fine quality of 143 g/m<sup>2</sup> as a <example 2 of comparison> base material.

[0082] <Example 3 of a comparison> Only the layer which consists of a thermoplastic organic resin particle used in in

the paper [ resin covering ] it used with said record sheet 1 with said record sheet 1 was applied by the same solid content coverage.

[0083] <Example 4 of a comparison> Only the ink absorbing layer used in in the paper [ resin covering ] it used with said record sheet with said record sheet 1 was applied by the same solid content coverage.

[0084] The ink jet record sheet as well as said record sheet 1 was produced except the liquid presentation of the <example 5 of comparison> ink absorbing layer having been shown below. In addition, solid content coverage of an ink absorbing layer was taken as 10 g/m<sup>2</sup> like the example 1.

[0085]

Liquid presentation porosity silica pigment of an ink absorbing layer SY-445 (30% water dispersion) The 50 sections PVA made from Japanese SAIRISHIA 117 (10% water solution) The 30 sections Kuraray make [0086] About each sheet which were obtained by carrying out, it is Novajet like the above. Color ink (GA ink) was used for the PRO (product made from ENCAD) ink jet oban printer, and the evaluation image was printed. After drying the created printing object enough, heating eburnation processing was performed by letting two heating rollers pass using the large-sized laminator (the Fuji film company make M-36), inserting a printing object with polyester film. In addition, the planar pressure at the time of heating eburnation processing is 15 Kgf(s)/square cm, and there were 120 degrees C of heating temperature. The following qualification test was performed about the sample which performed this heating eburnation processing, and the result shown in Table 1 was obtained.

[0087] Solid printing section nonuniformity: Y, M, C, R, G, B, and K each color was outputted to 3cmx5cm magnitude by setup of 100% of concentration, the image section was observed visually, and the existence of the nonuniformity accepted in the printing section of each color was judged. It is one of the indexes which show the clear nature of an image, and definition. The valuation basis is as follows.

[0088]

O : there is no trouble and excel very much.

O : excel.

\*\* : It can be used.

x : It is inferior.

[0089] Blot: Monochrome or color overlapping was recorded continuously and the adjoining printing section carried out the visual judgment of whether outflow has arisen at mutual or one of the two. It is one of the indexes which show the clear nature of an image, and definition. The valuation basis is as follows.

[0090]

O : there is no trouble and excel very much.

O : excel.

\*\* : It can be used.

x : It is inferior.

[0091] Gloss: The 60-degree gloss of the front face of the ink jet recording paper sheet which performed heating eburnation processing was measured, and the average was computed. Gloss is highly desirable so that a numeric value is high.

[0092] Water resisting property: The ink jet detail-paper sheet which performed printing and heating eburnation processing of an evaluation image was made to \*\*\*\* in water at a room temperature for 24 hours, and the visual judgment of NIJIMI of an image and the concentration fall to water depended for beginning to melt was carried out. The valuation basis is as follows.

[0093]


O : there are not NIJIMI and a concentration fall and change of an image is not accepted.

\*\* : The image is maintained although concentration fell slightly.

x : Ink began to melt and the image collapsed.

[0094]

[Table 1]

 ID=000002

[0095] Also in which evaluation criteria, as for the sheet for ink jet record of this invention, the good result was obtained so that clearly from the above-mentioned result.

[0096] It is the multilayer extrusion method about the layer which consists of the ink absorbing layer coating liquid and the thermoplastic organic resin particle which are shown below on the resin covering paper base material used for the record sheet 1 of example 2 example 1. After adjusting each paint volume and carrying out coincidence spreading so that the solid content coverage of the layer which the solid content coverage of an ink absorbing layer becomes from 25g/m<sup>2</sup>, and a thermoplastic organic resin particle may be set to 8g/m<sup>2</sup>, a cooling set is immediately carried out for 10 seconds, and the desiccation zone where temperature is high was passed gradually, the temperature and humidity of a desiccation zone were controlled and the sheet 10 for ink jet record of this invention was produced so that surface wet-bulb temperature might become 30 degrees C or less.

[0097]

Liquid presentation of an ink absorbing layer;

A gaseous-phase method silica (12nm of diameters of a primary particle) / product made from 200V Japan Aerosil (10% water solution) 69 section polyvinyl alcohol / PVA117 Kuraray Co., Ltd. make (10% water solution) 29 section G 2-ethylhexyl sulfo succinic-acid soda (1% water solution) The two sections [0098]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;

Ethylene-vinylacetate copolymer (10% water dispersion) The 100 sections The minimum membrane-formation temperature: 90 degrees C, particle-size: 7micrometer (CHEMIPEARL V-200 Mitsui Chemicals make)

Polypropylene wax (10% water dispersion) The 100 sections The minimum membrane-formation temperature: 142 degrees C, particle-size: 1-micrometer (CHEMIPEARL WP-100 Mitsui Chemicals make) polyvinyl alcohol / PVA117 Kuraray Co., Ltd. make (10% water solution) The ten sections [0099] After printing according to the various test methods later mentioned on the sheet for ink jet record created as mentioned above, heating eburation processing was performed by letting between two heating rollers pass, inserting the sheet for ink jet record for the upper and lower sides with a 100-micrometer polyethylene terephthalate film using the Fuji Photo Film large-sized laminator M-36. In addition, the planar pressure at the time of heating eburation processing was 15 Kgf(s)/square cm, and heating temperature was 120 degrees C.

[0100] The coating liquid presentation of a <production of record sheet 11 of this invention> ink absorbing layer was shown below, and it produced like said record sheet 10 except having set solid content coverage of an ink absorbing layer to 10g/m<sup>2</sup> further.

[0101]

Liquid presentation of an ink absorbing layer;

Liming gelatin (8% water solution) 49 section polyvinyl pyrrolidone (K-30) (8% water solution) The 49 section G 2-ethylhexyl sulfo succinic-acid soda (1% water solution) 2 section [0102] The coating liquid presentation of a <production of record sheet 12 of this invention> ink absorbing layer was shown below, and it produced like said record sheet 10 except having set solid content coverage of an ink absorbing layer to 10g/m<sup>2</sup> further.

[0103]

Liquid presentation of an ink absorbing layer;

Liming gelatin (8% water solution) 49 section carboxymethyl cellulose (8% water solution) The 49 section G 2-ethylhexyl sulfo succinic-acid soda (1% water solution) 2 section [0104] It produced like said record sheet 10 except the liquid presentation of the layer which consists of a <production of record sheet 13 of this invention> thermoplasticity organic resin particle having been shown below. However, the heating temperature at the time of heating eburation processing was set as 110 degrees C.



[0105]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
Ethylene-vinylacetate copolymer (10% water dispersion) The 100 sections The minimum membrane-formation temperature: 90 degrees C, particle-size:7-micrometer (CHEMPEARL V-200 Mitsui Chemicals make) polyethylene wax (10% water dispersion) The 100 sections The minimum membrane-formation temperature: 115 degrees C, particle-size:7-micrometer (CHEMPEARL W-308 Mitsui Chemicals make) polyvinyl alcohol / PVA117 Kuraray Co., Ltd. make (10% water solution) The ten sections [0106] The ink jet record sheet as well as said record sheet 10 was produced except having used the white polyethylene terephthalate film (the product made from ICI MERINEKKUSU 97 micrometers) as a <record sheet 14 of this invention> waterproofness base material.

[0107] The ink jet record sheet as well as said record sheet 10 was produced except having changed the planar pressure at the time of carrying out the <record sheet 15 of this invention> heating eburnation into 3 Kgf(s)/square cm.

[0108] The ink jet record sheet as well as said record sheet 10 was produced except having changed the planar pressure at the time of carrying out the <record sheet 16 of this invention> heating eburnation into 0.4 Kgf(s)/square cm.

[0109] The ink jet record sheet as well as said record sheet 10 was produced except having changed the planar pressure at the time of carrying out the <record sheet 17 of this invention> heating eburnation into 25 Kgf(s)/square cm.

[0110] <Example 6 of a comparison> The layer which consists of a thermoplastic organic resin particle used in in the paper [ resin covering ] it used with said record sheet 10 with said record sheet 10 was applied, and the ink absorbing layer further used with said record sheet 10 on it was respectively applied by the extrusion method. All solid content coverage was made the same as that of said record sheet 10.

[0111] The ink jet record sheet as well as said record sheet 10 was produced except having used the paper of fine quality of 143 g/m2 as a <example 7 of comparison> base material.

[0112] <Example 8 of a comparison> Only the layer which consists of a thermoplastic organic resin particle used in in the paper [ resin covering ] it used with said record sheet 10 with said record sheet 10 was applied in the amount of the same solid content.

[0113] <Example 9 of a comparison> Only the ink absorbing layer used in in the paper [ resin covering ] it used with said record sheet 10 with said record sheet 10 was applied in the amount of the same solid content.

[0114] The ink jet record sheet as well as said record sheet 10 was produced except the liquid presentation of the layer which consists of a <example 10 of comparison> thermoplasticity organic resin particle having been shown below.

[0115]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
Ethylene-vinylacetate copolymer (10% water dispersion) The 100 sections The minimum membrane-formation temperature: 90 degrees C, particle-size:7micrometer (CHEMPEARL V-200 Mitsui Chemicals make)  
Polyvinyl alcohol / PVA117 Kuraray Co., Ltd. make (10% water solution) The five sections [0116] The ink jet record sheet as well as said record sheet 10 was produced except the liquid presentation of the layer which consists of a <example 11 of comparison> thermoplasticity organic resin particle having been shown below.

[0117]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;  
Polypropylene wax (10% water dispersion) The 100 sections The minimum membrane-formation temperature: 142 degrees C, particle-size:1-micrometer (CHEMPEARL WP-100 Mitsui Chemicals make) polyvinyl alcohol / PVA117 Kuraray Co., Ltd. make (10% water solution) The five sections [0118] About each sheet which were obtained by carrying out, it is Novajet like the above. Color ink (GA ink) was used for the PRO (product made from ENCAD) ink jet oban printer, and the evaluation image was printed. After drying the created printing object enough, the following qualification test was performed about the sample which performed heating eburnation processing, and the result shown in Table 2 was obtained.

[0119] Gloss: The 60-degree gloss of the front face of the ink jet recording paper sheet which performed heating eburnation processing was measured, and the average was computed. Gloss is highly desirable so that a numeric value is high.

[0120] Water resisting property: The ink jet detail-paper sheet which performed printing and heating eburnation processing of an evaluation image was made to \*\*\*\* in water at a room temperature for 24 hours, and the visual judgment of NIJIMI of an image and the concentration fall to water depended for beginning to melt was carried out. The valuation basis is as follows.

[0121] O : there are not NIJIMI and a concentration fall and change of an image is not accepted.

\*\*: The image is maintained although concentration fell slightly.

x: Ink began to melt and the image collapsed.



[0122] \*\*\*\*-proof: The ink jet recording paper sheet which performed printing and heating eburnation processing of an evaluation image was rubbed with the cloth of cotton, the front face got damaged, and the visual judgment of extent was carried out. The valuation basis is as follows.

[0123]

O : a blemish is not accepted at all.

O : practically with [ although a blemish is accepted slightly ] no problem completely.

\*\* : Although a blemish is accepted, it is the level practically which can be used.

x : A blemish is in the whole surface, an image collapses, and it is level [ that it cannot be used practically ].

[0124]

[Table 2]

試料	光沢	耐水性	耐傷性
本発明10	82	○	○
本発明11	90	○	○
本発明12	90	○	○
本発明13	84	○	△~○
本発明14	85	○	○
本発明15	80	○	○
本発明16	60	△	△
本発明17	65	△	△~○
比較例6	22	x	x
比較例7	29	x	△~○
比較例8	90	x	△~○
比較例9	45	x	○
比較例10	82	○	x
比較例11	19	x	x

[0125] This invention is excellent in high gloss at a water resisting property and \*\*\*\*-proof so that clearly also from the result of Table 2.

[0126] It is the multilayer extrusion method about the layer which consists of the ink absorbing layer coating liquid and the thermoplastic organic resin particle which are shown below on the resin covering paper base material used for the record sheet 1 of example 3 example 1. After adjusting each paint volume and carrying out coincidence spreading so that the solid content coverage of the layer which the solid content coverage of an ink absorbing layer becomes from 25g/m<sup>2</sup>, and a thermoplastic organic resin particle may be set to 8g/m<sup>2</sup>, a cooling set is immediately carried out for 10 seconds, and the desiccation zone where temperature is high was passed gradually, the temperature and humidity of a desiccation zone were controlled and the sheet 18 for ink jet record of this invention was produced so that surface wet-bulb temperature might become 30 degrees C or less.

[0127]

Liquid presentation of an ink absorbing layer;

a gaseous-phase method silica (12nm of diameters of a primary particle) / 200V Japan -- 69 section polyvinyl alcohol made from Aerosil (10% water solution) / PVA117 Kuraray Co., Ltd. make (10% water solution) 29 section G 2-ethylhexyl sulfo succinic-acid soda (1% water solution) The two sections [0128]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;

Ionomer (10% water dispersion) The 100 sections The minimum membrane-formation temperature: 94 degrees C, particle-size:0.5-micrometer (CHEMIPEARL S-300 Mitsui Chemicals make) polyvinyl alcohol / PVA117 Kuraray Co., Ltd. make (10% water solution) The five sections [0129] The ink jet record sheet as well as said record sheet 18 was produced except the liquid presentation of the layer which consists of a <record sheet 19 of this invention> thermoplasticity organic resin particle having been shown below.

[0130]

Liquid presentation of the layer which consists of a thermoplastic organic resin particle;

Ionomer (10% water dispersion) The 100 sections The minimum membrane-formation temperature: 94 degrees C, particle-size:0.5-micrometer (CHEMIPEARL S-300 Mitsui Chemicals make) polypropylene wax (10% water dispersion) The 50 sections The minimum membrane-formation temperature: 142 degrees C, particle-size:1-micrometer (CHEMIPEARL WP-100 Mitsui Chemicals make) polyvinyl alcohol / PVA117 Kuraray Co., Ltd. make (10% water solution) The 7.5 sections [0131] The ink jet record sheet as well as said record sheet 18 was produced except the liquid presentation of the <record sheet 20 of this invention> ink absorbing layer having been shown below.

[0132]

Liquid presentation of an ink absorbing layer;

Liming gelatin (8% water solution) 49 section carboxymethyl cellulose (8% water solution) The 49 section G 2-

ethylhexyl sulfo succinic-acid soda (1% water solution) 2 section [0133] The ink jet record sheet as well as said record sheet 19 was produced except the liquid presentation of the <record sheet 21 of this invention> ink absorbing layer having been shown below.

[0134]

Liquid presentation of an ink absorbing layer;

Liming gelatin (8% water solution) 49 section polyvinyl pyrrolidone (K-30) (8% water solution) The 49 section G 2-ethylhexyl sulfo succinic-acid soda (1% water solution) 2 section [0135] <Example 12 of a comparison> One layer of ink absorbing layers shown below was applied in in the paper [ resin covering ] it used with said record sheet 18 by amount of solid content 10 g/m2.

[0136]

Liquid presentation of an ink absorbing layer;

Ionomer (10% water dispersion) The 243 sections The minimum membrane-formation temperature: 94 degrees C, particle-size:0.5-micrometer (CHEMIPEARL S-300 Mitsui Chemicals make) polyvinyl alcohol / PVA117 Kuraray Co., Ltd. make (10% water solution) The 100 sections [0137] Like the above, each record sheet which were obtained by carrying out was printed and heat-treated according to the example 1, and gloss, a water resisting property, and \*\*\*\*-proof were examined. Furthermore, the following criteria also estimated the ink absorptivity after printing. The result is shown in Table 3.

O : ink is not full of the printing side at all.

\*\* : Ink is slightly full of the printing side.

x: Much ink is full of the printing side.

[0138]

[Table 3]

試料	光沢	耐水性	耐傷性	インク吸収性
本発明 18	82	○	○	○
本発明 19	82	○	◎	○
本発明 20	90	○	○	△
本発明 21	90	○	◎	△
比較例 12	80	x	△	x

[0139] From the above-mentioned result, by preparing the layer containing ionomer resin on an ink absorbing layer, it can excel in gloss, ink absorptivity, and a water resisting property, and \*\*\*\*-proof can be raised further.

[0140]

[Effect of the Invention] By this invention, the sheet for ink jet record which was excellent in the clear nature of an image, definition, and homogeneity, and whose gloss was also high and was further excellent also in the water resisting property after printing and \*\*\*\*-proof can be offered.

[Translation done.]